Fermilab Friends for Science Education

Annual Report

2002

Year Anniversary

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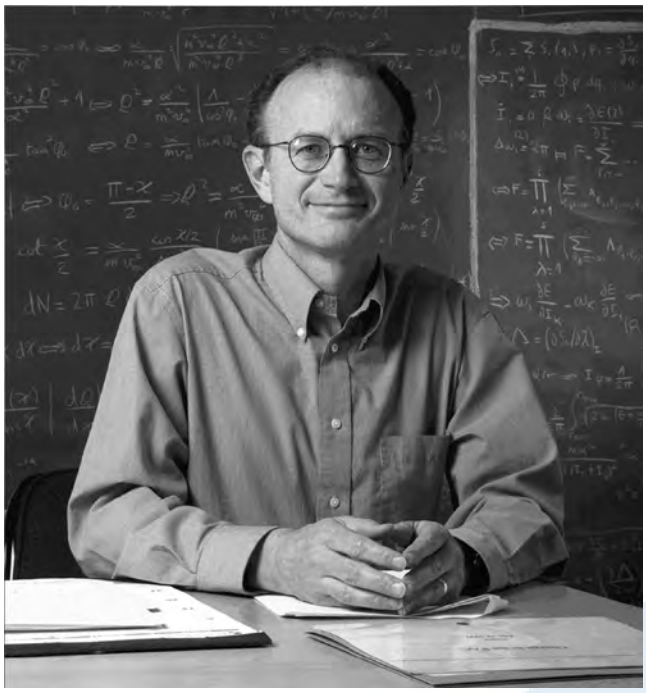
Leaders in education, government, and industry regularly stress the importance of doing a better job at teaching science. Our society needs to have a workforce that knows and understands science. Recently, the Hart-Rudman Report on National Security emphasized the importance of training "the needed numbers of science and engineering professionals as well as qualified teachers in science and math." We also need a broad community of people with sufficient education to understand the many scientific issues that have an impact on our public life.

It is easier to diagnose this problem than to know how to fix it. In this environment, the experience of the Fermilab Education Office is particularly valuable. As a result of its programs, the students in the surrounding communities are receiving the full benefit of the special resources that are available at a great scientific laboratory. We need the continued strong support of Fermilab Friends for Science Education (formerly Friends of Fermilab) to maintain the quality of our science education programs.

I am grateful for the support that FFSE gives to the Education Office. FFSE and Fermilab have developed a uniquely productive partnership over seventeen years. Please help us keep up the good work.



Michael Witherell

Michael Witherell, Director
Fermi National Accelerator Laboratory

Fermi National Accelerator Laboratory
Batavia, Illinois
Operated by Universities Research Association, Inc.
Under contract with the U.S. Department of Energy

Twenty years! That's how long Friends of Fermilab, now called Fermilab Friends for Science Education, has been providing support for Fermilab's precollege science education programs. FFSE continues to fulfill its mission to:

- Encourage young people to pursue careers in science and engineering.
- Enhance the quality of precollege science education in public and private schools.
- Promote a broader public awareness and understanding of science.

With support from Fermilab Friends for Science Education, the Fermilab Education Office is able to offer indepth staff development programs that have a lasting impact on science education. These institutes and workshops have relatively high costs compared with other programs offered at the Lederman Science Center.

Fermilab Friends for Science Education supports Saturday openings of the Lederman Science Center. In 2002 FFSE initiated a scholarship program for teachers to attend workshops, buses for class field trips and children who attend science adventures. In addition, FFSE covers unusual program costs that grants may not cover; those "little things" are often the special touches that make teachers feel welcome at Fermilab.

Precollege education programs continue to enjoy strong support from Fermilab director, Michael S. Witherell, and staff feels comfortable volunteering to help with our programs. In fact, over 200 individuals volunteer each year. With a new name and continued support from our members, FFSE will maintain its role as a leader in precollege science education in the 21st century.

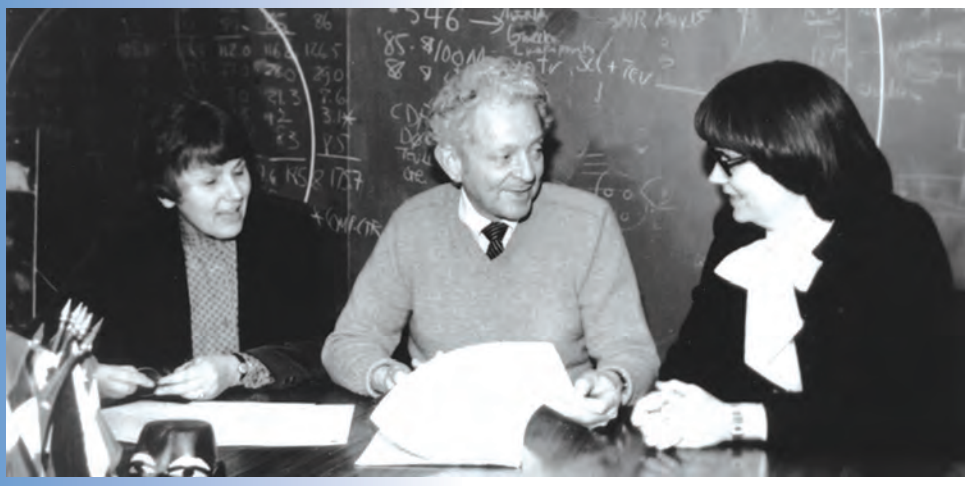
Marjorie G. Bardeen

Marjorie G. Bardeen, President
Fermilab Friends for Science Education

Early History of Fermilab Friends for Science Education

by Stanka Jovanovic

We are celebrating twenty years of Friends of Fermilab, recently renamed Fermilab Friends for Science Education (FFSE). Actually we wanted to be Friends of Fermilab Association, FFLA, but the acronym was already in use in the state. So, officially we were registered as Friends of Fermilab. But, we liked FFLA and used it shamelessly till last year when FFSE came into existence.



On March 8, 1983, we mailed the state incorporation papers and the IRS form requesting the not-for-profit status. On March 11, 1983, we mailed the very first grant proposal to 40 foundations and to the Department of Energy. On March 13, 1983, A Nation at Risk Report was published bemoaning our country's state of science education. On March 16, 1983, FFSE received enough money from three foundations and DOE to run our very first program: Summer Institute for Science Teachers.

Our timing could not have been better. But, it took a group of dedicated individuals nearly two years to create FFSE before it emerged with a bang in March, 1983. It all started in April, 1981, when Drasko, my husband, asked me to tell Leon Lederman how to organize "friends" to raise private monies to enable Fermilab to offer programs to high school science teachers. Apparently science teachers were coming to Fermilab's Saturday Morning Physics, a series of lectures for high school students, to learn with the students. This told Leon that the teachers also needed to learn modern physics. Fermilab had all the resources to help, but could not use federal funds to do so. Well, I wrote up a talking paper, went to Fermilab and handed it to Leon. Leon's reaction was "all I need is a two million dollar endowment, enough to offer Fermilab resources to benefit high school science education." I wished him good luck and went back to my life as a research chemist, and a mother of two teenage girls. But Leon started me thinking. So I picked up the phone and called Robert McCullough and asked him how easy it would be to raise two million dollars. I expected Bob to laugh me off; instead, he said, "it depends what you need it for." I knew Bob, a business executive, was an experienced fundraiser, and to my surprise, he thought that in spite of Fermilab being a federally funded institution, that funds could be raised for science education programs.

Several months later, on February 2, 1982, after a pleasant dinner party, Drasko and I were saying good night to Leon on his doorstep. It was a bitterly cold night. Suddenly, standing in the freezing cold, Leon asked me to please do something about creating Fermilab Friends for Science Education. The man is really serious, I thought. A few days later I decided to ask Marge Bardeen if she would be willing to help. Marge thought for a moment, and said yes, but only if teachers have the say in what programs Fermilab offers. Then I called Bob McCullough and he agreed to help. Then I asked Jeanie Fisk, who ran her own preschool in Batavia, if she would help. She thought it was a good idea for Fermilab to do something to help schools teach science. Ellen Lederman had no choice but to help. So, I went to Leon with my conditions: We will work out of his office, and his assistant, Judy Zielinski, will help. Leon agreed, and the organizing group was born.

Between March and May, 1982, the group met several times and developed a proposal to organize Fermilab Friends for Science Education Association. Late in May, 1982, the proposal was presented to Leon, who promptly presented it to Fermilab's Board of Trustees. On October 3, 1982, I was summoned to come to Fermilab to talk to the trustees. They full-heartedly approved of the Friends but were very skeptical about our ability to raise money for Fermilab, an institution funded by taxpayers. Well, I figured what did they know?

At this point, Marge had had enough of talking. She told us it was time to plan a program. The group agreed. Within a month, Marge, with the help of Marge Cox, George Zahrobsky, and Bill West, orchestrated a needs assessment with educators and community leaders to identify how best Fermilab could help science education in local schools. The outcome was the proposal for the Summer Institute for Science Teachers. Thus, we come to March, 1983.

This early history of FFSE would not be complete if I did not mention Carl Safanda and Malcolm Douglas. Carl, a lawyer, and Mac, an accountant and a financial advisor, were Bob McCullough's friends. Bob talked them into volunteering to help the organizing group with all the legal and financial issues an organization that is to become needs to deal with. Then, they both served on the FFSE Board of Directors for many years to come.

Today the FFSE success story is history. Thousands of teachers and several hundred thousands of students from across the country have participated in over thirty Fermilab programs. The Leon M. Lederman Science Education Center is the crowning glory of the effort started by our small organizing group. In retrospect, I can hardly believe we had the guts to do it. But, we did it, and I am certainly proud to have been a part in making it all possible.

A note from Leon . . .

I began a program of science education outreach upon becoming Fermilab Director Designate in 1978/79. This was to invite about 70 high schools, within a radius of about twenty miles of Fermilab, to attend a program: Saturday Morning Physics. This would be three hours of lectures and tours of the Laboratory. Junior and senior students were invited. There was a huge response, so we divided the students into three groups of 100 students; each group was given ten Saturday mornings, consecutively.

Fermilab postdocs vied to do the teaching. The program was so successful that ideas poured in for continuations of this outreach. It was then that the need was perceived for a Friends of Fermilab who could organize educational activities, raise money, e.g., by cake sale activities, write proposals to NSF, State of Illinois, philanthropy, etc., and to finger volunteers.

The logic of a vigorous outreach to K-12 students on the part of a national laboratory was rock solid. For one, this was an excellent way to familiarize the tax-paying general public (parents, teachers, the students who would eventually pay taxes and vote, etc.) with the work of the laboratories. For another, the impressive, even awesome apparatus, computers, engaging postdocs and other scientists make a deep impression on the young visitors, influencing attitudes and careers. A Friends of Fermilab group was essential in serving as a bridge from lab to public.

Annenberg/CPB Channel

The nation's first leadership academy of its kind, the August 12-16 session of the Fermilab Annenberg/CPB Channel video series "Assessment in Math and Science: What's the Point?" was the basis for instructing 12 participating educators from the Chicago and suburban area. The week-long academy was developed and conducted by local educators: Dr. William Fraccaro of Franklin Middle School, Community Unit School District 200, Wheaton; Dr. Sher Renken of Waubonsie Valley High School, Indian Prairie Community Unit School District 204, Aurora; Dr. Carole Hillman, College of Education, Elmhurst College, Elmhurst; and Susan Dahl, Fermilab Lederman Science Center.

Upon completion of the academy, the participants were certified to lead teacher training using this series of Annenberg/CPB materials. They drafted a professional development plan that they carried out during the upcoming school year. Each participant received a mini-grant for additional materials and could earn graduate credit through Aurora University. The program was supported by a $13,000 grant from Annenberg/CPB Channel to Fermilab Friends for Science Education.

Annenberg/CPB, a partnership between the Annenberg Foundation and the Corporation for Public Broadcasting, was media and telecommunications to advance teaching methods in American schools.

Annenberg/CPB funds educational series and teacher professional development workshops for the Annenberg/CPB Channel. The channel is distributed free by satellite to schools and other educational and community organizations nationwide. Among its services, the channel offers workshops through which K-12 teachers can earn graduate credit..

"This has been the most outstanding example of professional development that I have been involved in."

"Wow! What a full "bushel basket" of resources I have received. This is the best workshop I have attended."

QuarkNet Illinois

by Tom Jordan

Imagine telling your high school physics class about this summer vacation: weeks of research and testing in the physics lab at UIC that culminated in an experiment from atop the Sears Tower in Chicago!

That's what 11 QuarkNet teachers did during the summer of 2002 working with UIC (and DØ) physicist Mark Adams.

The teachers built plastic scintillator counters, attached phototubes and tested them with radioactive sources. They then attached the devices to a small readout board designed and built in Fermilab's Particle Physics Division. These boards allowed the teachers to use their counters as muon detectors seeing particles created in our upper atmosphere in cosmic ray interactions. The plastic scintillator indicated the presence of a moving, charged muon by a tiny flash of light. The attached photomultiplier tubes turned this light into an electronic pulse that is analyzed by the logic on the readout board.

The teachers assembled and commissioned their detectors at UIC and then obtained permission to go to the very roof of the Sears Tower to measure the muons there. Special relativity allows one to calculate the difference in muon rate at disparate heights. The teachers could go back to their classes with data that support learning of relativity by comparing the rate at two different altitudes.

Fermilab Friends for Science Education received a grant from the Illinois State Board of Education to support these QuarkNetters. The teachers purchased laptops, received additional stipends and put that Scientific Literacy grant to good use. These teachers and their students are certainly more literate in the machinery of science after several stop-starts to their work.

The grant also supported the work of other QuarkNet teachers in the Chicago area. Teachers from Argonne, Fermilab, and the University of Chicago are also

involved in QuarkNet; most of these teachers explore cosmic rays with their students by using this same hardware. They are all excited about the newest version of the hardware which will allow them to look for showers of cosmic rays which may have come from one very energetic event.

The teachers at the top of the Sears Tower learned something about their detectors on that day. The large antennae atop the skyscraper created such large, oscillating electromagnetic fields that they had to devise some shielding to protect their cables from the interference. It took the group a few hours to figure out the source of the interference, but they got it. Talk about a summer vacation!

Lederman Science Education Center's 10th Birthday Celebration

A beautiful October Sunday afternoon. A couple of hundred party-goers. Exhibits looking their best. A lively cryogenics show. A distinguished birthday celebrant. A fabulous birthday cake complete with physics decorations. Put this altogether and you have

the tenth "birthday" party for the Lederman Science Center.

It was October 1992 when the Secretary of Energy, Admiral James D. Watkins joined Lab Director John Peoples to officially open the Leon M. Lederman Science Education Center. Under a red-and-white-striped tent, guests joined the inaugural festivities. Three Fermilab directors were present as were a number of guests from the Department of Energy, the State of Illinois and Fermilab Friends for Science Education. Teachers and students gave the exhibits a good trial run, and guests explored the Teacher Resource Center, Science Lab and Tech Room.

Ten years later the richness of the Center is evident. The lobby has a reception desk/store counter and Lederman display. The Teacher Resource Center is brimming with books, instructional units, journals and computers. The Ideas Room is decked out as a space ship control room inspired by the Starship Enterprise. The Tech Room has a set of networked iMacs. The Science Lab is full of instructional materials for prairie field studies, science adventures and teacher workshops.

The Lederman Science Center has developed with support from Fermilab Friends for Science Education. Computers in the Tech Room, laptops for the Science Lab, new exhibits, materials for the Teacher Resource Center, staff development programs for teachers all have benefited from grants through FFSE.

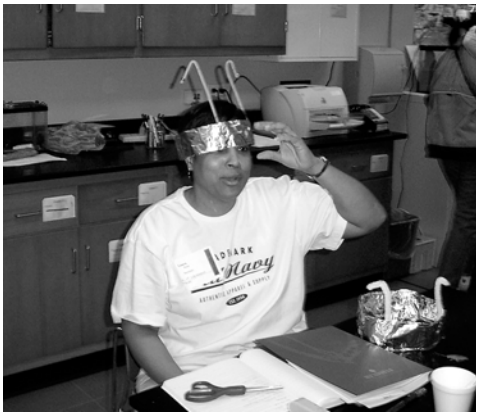
The Lederman Science Center, as a home for precollege education programs, is a unique facility for a DOE national laboratory. The building which combines the functions of science center, resource center and classroom provides stability for the programs. We look forward to many more years of partnerships with educators in our area to make Fermilab resources available for precollege education.

Museum Partners

Fermilab Friends for Science Education has been supporting Fermilab's participation in the Museum Partners Science Program since 1996. The Chicago Museum Partners work collaboratively to offer staff development programs for Chicago public school teachers. Elementary, midlevel and high school teachers may enroll in courses in earth, life and physical science. Each course requires participation in seven program sessions (each at a different partner) lasting 6.5 hours each and held on Saturdays. Each session is at a different partner. Teachers may earn a total of 15 semester hours of graduate credit.

This year 57 teachers attended one of five sessions at Fermilab. Three were life science sessions, one at each grade level, and two were physical science sessions, one each for elementary and midlevel teachers. Docents developed and taught the classes which are based on our field trip programs.

The Museum Partners Science Program is highly successful, and Fermilab is one of the stronger partners. One teacher remarked, "MPSP is the best educational program that I have ever experienced. It provides teachers with a wealth of current information that is presented by highly qualified and enthusiastic instructors, who instill confidence in the teachers participating in the program."



"I can hardly wait to use this in my class on Monday!"

Program Highlights 2002

January
Staff taught the first of five classes for the **Museum Partners Science Program** for Chicago Public School teachers.

February
Staff held a needs assessment for **upgrading the Lederman Science Center exhibits.** DOE and an anonymous donor to FFSE supported the upgrade.

March
Staff ran two **ARISE workshops** to collect implementation suggestions from the field at the annual National Science Teachers Association Convention in San Diego.

Eighty-nine teachers attended the **Symposium on the Nature of Science.**

April
Over 575 people attended the **Wonders of Science Show**. LInC teachers, Chris Marszalek, Jill Mueller and Pat Pentek received honors as Teachers of the Year.

May
Four undergraduates who plan to be teachers began ten-week internships in the **Preservice Teacher Program** offered by the U.S. Department of Energy's Office of Science at several national labs.

The **QuarkNet website** was named to the Eisenhower National Clearinghouse's Digital Dozen.

June
Twenty–four teachers attended the QuarkNet Lead Teacher Institute at Fermilab.

July
A **cosmic ray detector** that provides data online in real time for high school students began its inaugural run.

August
Twelve educators attended the first **Annenberg Leadership Academy**.

Sixty students from the **Northwestern University NU-TEACH** (Teacher Education Alternative for Chicago) program spent a day at Fermilab learning about the resources available for teachers.

Fall
Students from 62 schools visited the Fermilab prairie as part of their science classes. Over 5,600 students came to the Lab on these **field trips**.

October
The Lederman Science Center had its **10th birthday party** including a beautiful birthday cake for Leon Lederman's 80th birthday.

November
The Lederman Science Center was the site of **The Regional Software Revie**w supported by Fermilab and the North Central Eisenhower Mathematics and Science Constorium. QuarkNet hosted the Advisory Group for its annual meeting.

December
The Office provided exhibits for and sent a representative to a grand opening of the Utica **Children's Museum** in support of a new partnership established between the DOE Office of Science and the museum.

Programs

Fermilab Friends for Science Education continues to have a significant impact on precollege education as can be seen in the number of innovative and effective programs it has helped develop. These programs reached over 21,000 students and 7,200 teachers during 2002. For information on current programs, check our Web site at www-ed.fnal.gov/.

Annenberg Leadership Academy
12 educators

Cryogenic Show
4,780 students

DOE Preservice Teacher Program
4 students

The Fermilab ARISE Project
46 teachers

Guided Tours
3,009 students and 139 teachers

Lederman Science Center Visitors
1,429 visitors

Museum Partners
50 teachers

Physics Science Experience
2,843 students and 25 teachers

Prairie Science Experience
6,356 students and 52 teachers

QuarkNet Research Experience
19 teachers

QuarkNet Institutes
358 teachers

Science Adventures
1,045 students

Teacher Resource Center
Eisenhower National Clearinghouse
Demonstration Site
Professional Networks
Software Review
Workshops
Over 1,317 educators

Symposium on the Nature of Science
89 educators

The success of the 2002 FFSE programs rests with these outstanding program leaders:

Michael Bachrodt, Fremd High School, Palatine
Nancy Berkas, NCEMSC, Naperville • Richard Billings, Glenbard West High School, Glen Ellyn • Joseph Cave, Naperville School District 203, Naperville • Trudi Coutts, Naperville School District 203, Naperville • James D. Cox, Clarendon Hills Middle School, Clarendon Hills • Karl Craddock, Fremd High School, Palatine • Robin Dombeck, Brookfield Zoo, Brookfield • William F. Fraccaro, Johnson School, Warrenville • Patricia M. Franzen, Wild Enterprises, Metamora Sharon Gatz, Beebe Elementary School, Naperville • Gail Green, Keller Junior High School, retired • Robert Grimm, Fremd High School, Palatine Tamra Hack, Plainfield School District 202, Plainfield • Lynn Hamper, Naturalist, Aurora • Karen Jensen, Aurora East School District 131, Aurora Bernard J. Jokiel, Washington Middle School, Aurora • Randy Jones, Glen Ellyn School District 41, Glen Ellyn • Marge Keefe, St. Charles School District 303, St. Charles • Steve Keefe, Batavia School District 101, Batavia Cheryl LaMaster, St. Charles North High School, St. Charles • Paul Madsen, Rosary High School, Aurora • Lee R.Marek, University of Illinois, Chicago • Chris Marszalek, Twin Groves Junior High School, Buffalo Grove • Stephen Meehan, Naperville Community School District 203, Naperville • Jill Mueller, West Chicago Middle School, West Chcago Mary Sue Offut, SciTech and Field Museum Volunteer, Aurora • Cynthia Pattison, NCEMSC, Naperville • Pat Pentek, West Chicago Middle School, West Chicago • Sher Renken, Waubonsie Valley High School, Indian Prairie Unit School District 204, Aurora • Linda Richards, Batavia School District 101, Batavia Barbara A. Romack, Kaneville North Elementary School, Elburn Robert Thompson, Glen Ellyn School District 41, Glen Ellyn • Sharon White, Grissom Junior High School, Tinley Park • Patricia Witte, Naperville • Wayne R. Wittenberg, Glen Ellyn School District 41, Glen Ellyn Barbara Youngren, NCEMSC, Naperville • Jerry K. Zimmerman, Fermilab Anna Zuccarini, Crone Middle School, Naperville

Education Office staff administers and supports the program leaders.

Marjorie G. Bardeen, Manager • Carol S. Benson, Administrative Support Assistant Melissa L. Clayton, Administrative Support Assistant • Susan M. Dahl, Education Specialist • LaMargo A. Gill, Editor • Thomas A. Jordan, Education Specialist • Nancy Lanning, Public Information Specialist • Priscilla B. Meldrim, Public Information Specialist Susan Mendelsohn, Assistant Education Specialist • Laura A. Mengel, Computer Specialist Spencer L. Pasero, Education Specialist • Elizabeth K. Quigg, Computer Specialist • Diana Smailus, Administrative Support Assistant • Gayle L. Stephens, Administrative Support Assistant

Docents facilitate student field trips and other Education Office activities and supervise the Lederman Science Center.

Lynda A. Ballingall • Karen Bass • Susan Dumford • Vida Goldstein • Mary Hawthorne Gail Haynes • H. Ted Hoesel • Helen D. Huie • Jacqueline J. Krock • Wendy G. Mouche Mary J. Murphy • David R. Seymour • K. Sue Sheehan • Mary Ann Stowell • Felicia Svoboda Anne Mary Teichert • Yvonne H. Twomey • William A. Welch • Lawrence Welsh

Revenue and Expenses

Revenue/Contributions ($ 000)	2001 (audited)	2002 (audited)	20 Years (1982-2002)
Public Agencies	$ 193.2	$ 140.6	$4085.1
Private Foundations	32.8	1.0	512.6
Membership	14.3	14.9	245.5
Other	3.4	10.8	303.5
Total Revenue/Contributions	$ 243.7	$ 167.3	$5146.7
Expenses			
Programs	$221.2	$ 201.7	$3721.1
Administrative Overhead	33.5	31.0	1286.3
Total Expenses	$ 254.7	$ 232.7	$5007.4
Excess (Deficit) of Revenue/Contributions over Expenses	($11.0)	($65.4)	$ 139.3

Acknowledgments

Fermilab Friends for Science Education depends entirely on contributions and grants. We thank the Fermilab Friends for Science Education members, Tree of Knowledge contributors and the following organizations for their generous support of Fermilab education programs.

United State Department of Energy
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